IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#10 Decl. Marsha 1/9/01

Application Serial No.: 09/296,928	Group Art Unit: 2877
Filed: April 22, 1999	Examiner: Pham, H.
For: Chemical Mechanical Planarization (CMP) Slurry Quality Control Process And Particle Size Distribution Measuring Systems	Docket No.: 7009/018CP
Inventors: Cerni et al.	

DECLARATION OF TODD A. CERNI

I, TODD A. CERNI, hereby declare:

1. I am Manager of Research at Particle Measuring Systems, Inc., located at 5475 Airport Boulevard, Boulder, Colorado, where I am involved in directing various research and development activities, which include particle detector research and development. All statements made herein of my own knowledge are true, and all statements made on information and belief are believed to be true.

2. I have a B.S. in physics from Marquette University, an M.S. in physics from Indiana University, and a Ph.D. in atmospheric physics from the University of Arizona. I have 24 years of experience in electro-optics including many years in the field of electro-optical instrument design in general and particle measurement in particular. My duties include overseeing research in the particle measurement field in general, and in the single particle optical sensing (SPOS) area. Particle Measuring Systems is one of the leading companies in the SPOS field. I have presented or published more than 25 technical papers on the subject of particle measurement and its applications and have two issued patents in the field of instrumentation. A copy of my curriculum vitae is attached as Exhibit A.

3. Particle Measuring Systems, Inc. is the assignee of the above-identified patent application (hereinafter "the application").

4. I submit this Declaration to present to the examiner, in an authenticated manner, facts concerning the non-obviousness of the present claims in the application and relevant to the examiner's arguments presented in the Office Action dated September 26, 2000 (hereinafter "the Office Action").

5. I have read the present claims of the application, a copy of which is attached hereto as Exhibit B, the Office Action and the references cited therein, i.e., United States Patent No. 4,373,807 issued to Gerard Gouesbet (hereinafter, "Gouesbet"), United States Patent No. 5,485,270 issued to Freud et al. (hereinafter, "Freud et al."), United States Patent No. 5,422,712 issued to Shinichi Ogino (hereinafter, "Ogino"), "Commercial spectrophotometer for particle sizing" by Fabio Ferri et al. In *Applied Optics* Article No. XP 000685215 (hereinafter, "Ferri et al."), United States Patent No. 4,338,030 issued to Hendricus G. Loos (hereinafter, "Loos"), United States Patent No. 4,318,180 issued to Lundqvist et al. (hereinafter, "Lundqvist et al."), United States Patent No. 5,379,113 issued to Takeshi Niwa (hereinafter, "Niwa"), and "Analysis of particle sizes, concentration, and refractive index in measurement of light transmittance in the forward-scattering-angle range", by Anatoli P. Nefedov et al., *in Applied Optics* Publication No. XP 00685510 (hereinafter, "Nefedov et al."). (Note that the Examiner refers to this reference by the first name of the first author, i.e., "Anatoli").

6. An optically dense slurry is defined in the application as a particulate polydispersion consisting of 1% - 30% solids by weight of submicron particles suspended in a fluid. See page 7, lines 1 - 5.

7. A slurry as used in a chemical mechanical planarization (CMP) process is an optical dense slurry as defined in the application.

8. Typical particle densities in optically dense slurries, such as CMP slurries, are $10^{13}/cm^3$ to $10^{15}/cm^3$.

9. All of the references cited by the examiner relate to optical measurements which are unrelated to the subject matter of claims 1 and 26.

10. Lundqvist (1982) is specific to the paper industry, because it is intended to

measure millimeter size paper fibers, which is in the geometric optics regime. CMP slurries consist of sub-micron particles, in the Mie optics regime. The measurement and analysis techniques are totally different in these two regimes.

11. Loos (1982) describes the measurement of light scattered from water drops suspended in air. This patent deals with scattered, not transmitted light, and deals with optical media which is obviously not optically dense.

12. Gouesbet (1983) describes a single wavelength laser (column 4, lines 44 - 46) instrument designed to derive particle velocities through measurement of the Doppler shift of scattered light (column 3, line 5). To recover particle diameter, the author assumes that the particles are monodisperse (column 3, lines 14 - 15). This instrument has nothing in common with claims 1 and 26, which recite transmission measurements from a source including a plurality of wavelengths and in a medium that is not monodisperse. Transmitted light is that which has not been scattered; there is a fundamental difference between scattered and transmitted light.

13. Freud et. al. (1996) describes a dynamic light scattering analyzer which is fundamentally different than measuring the spectrum of transmitted light. Transmitted light is that fraction of photons which have neither been scattered nor absorbed. Column 1 of Freud et al. describes the principles of dynamic light scattering, based on measurement of the Doppler shift, which has nothing to do with the present invention.

14. Ogino (1995) describes measurement of fluorescent spectra, as it states in the title. Again, this is a totally different measurement technique than that utilized in the present invention; it only works on particles which fluoresce, and does not give a measurement of particle size. Fluorescence consists of emission of photons at a different (longer) wavelength than the absorbed photons.

15. The references as a whole teach one skilled in the art that optically dense materials cannot be analyzed using transmission of radiation.

16. Thus, no one skilled in the art would think that one could measure particles in an optically dense slurry using light transmission as claimed.

17. Those skilled in the art still believe that a CMP slurry is too dense optically to measure particle size distribution using light transmission measurements.

18. For example, in the last week of July of this year, I had conversations with Professor Luis Garcia-Rubio of the University of South Florida. Professor Garcia-Rubio is a co-founder of Ocean Optics, Inc., and has been working in the particle measurement field for about 15 years. For some time he has been trying to solve the problem of detecting particles in a CMP slurry.

19. Professor Garcia-Rubio was of the opinion that a CMP slurry has to be diluted to perform optical measurements on it. Hence, he is working to develop a practical method of diluting the slurry

20. He specifically pointed out to me that he had recently been granted a patent on a method for continuous dilution of a CMP slurry to permit optical measurements to be made on it. See United States Patent No. 5,907,108, attached as Exhibit C.

21. Those skilled in the art of particle measurement uniformly agreed with the view of Professor Garcia-Rubio at the time of the present invention.

22. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. §1001, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

12/29/00
Date

Todd A. Cerni
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